APPENDIX C
DESIGN EXAMPLES

C-1. Example 1: Concrete slab thickness for interior loads.

a. Problem. The floor slab for a warehouse will be designed based on the following information:

Traffic

Type of Traffic	*Average Daily Volume*	*Category*
5-axle trucks 4 axles, 5 kips each 1 axle, 10 kips	50	I
15-kip forklift or trucks	15	II
Stationary Live Load	1,200 pounds per square inch	
Interior Wall Load	1,400 pounds per linear foot	

Material properties

Concrete flexural strength = 650 pounds per square inch
Modulus of subgrade reaction, k = 150 pounds per cubic inch

b. Solution.

(1) Floor slab thicknesses h should be determined by using equivalent forklift truck axle load below.

Equivalent Forklift Truck Axle Load, kips	*Number of Axles*	*Average Daily Volume*	*Maximum Operations Per Day*	*Design Index*
5	4	50	200	4
10	1	50	50	4
15	1	15	15	7

Matching the axle loads and maximum operations per day in table 5-1, the design index for each axle-load group is selected as shown in the far right column in the above-mentioned table. Design index 7 is selected for the design. From figure 5-1, usingk = 150 pounds per cubic inch and 650 pounds per square inch flexural strength, slab thickness equal to 6.7 inches, and round to 7 inches should be selected.

(2) One must check for adequacy of 7 inch slab for stationary live load, w = 1 200 pounds per square foot. Table 3-1 should be entered using 650 pounds per square inch flexural strength concrete and 7 inch slab thickness; allowable stationary live load is selected, w =1,109 pounds per square inch. The w is adjusted based on k = 150 pounds per cubic inch.

$$w = 1{,}109 \sqrt{\frac{150}{100}} = 1{,}358 \text{lb/ft}^2 > 1{,}200 \text{lb/ft}^2$$

(3) Thickness, t_c, of thickened floor slab supporting interior wall weighing 1,400 pounds per linear foot should be determined by entering table 3-2 using 650 pounds per square inch flexural strength concrete and wall load p = 1,400 pounds per linear foot. Thus, t_c equals 10 inches, and t_c is adjusted based on k = 150 pounds per square inch.

$$t_c = 10 \sqrt[5]{\frac{100}{200}} = 9 \text{ inches}$$

from figure 3-1, minimum $t_c = h\ h_1$; $t_c = 7 + 2 = 9$ inches.

C-2. Example 2: Thickened floor slab design for exterior wall.

a. Problem. The thickened concrete floor slab supporting an 8 inch exterior load bearing wall weighing 1,000 pounds per linear foot should be designed.

Floor slab data

Thickness = 4 inches
Flexural strength = 600 pounds per square inch
Modulus of subgrade reaction k = 200 pounds per cubic inch

b. Solution. Table 3-3 should be entered using 600 pounds per square inch and wall load, p = 1,000 pounds per linear *foot.* Thickness t should be adjusted based on modulus of subgrade reaction, k = 200 pounds per cubic inch.

$$t_e = 10 \sqrt[5]{\frac{100}{200}} = 8.7$$

For thickened slab configuration, see table 3-3.

Note: For other practical considerations, i.e., frost line, erosion etc., the thickness, t_e, may be increased.

C-3. Example 3: Reinforced concrete slab.

a. Problem. It is decided that the 7-inch floor slab in Example 1 should be reduced to 6 inches by reinforcing the slab using 60,000-pounds per square inch yield strength steel reinforcement. The percent reinforcement required for the 6-inch slab should be determined.

b. Solution. From figure 5-4, a straight line should be drawn between h = 7 inches and h_r = 6 inches and extend line to S. This should read S = 0.13 percent.

C-4. Example 4: Concrete slab Thickness for tracked vehicle.

a. Problem. The floor slab thickness h, should be determined for a tank repair shop. The largest tank has a gross weight of 60 kips, Traffic is limited to 40 vehicles per day.

Material Properties:

Concrete flexural strength = 700 pounds per square inch
Modulus of subgrade reaction, k = 100 pounds per cubic inch

b. Solution. Based on 60 kips gross weight, equivalent forklift truck category II is selected from second tabulation in paragraph 3-2. From first tabulation in paragraph 3-2 for category II, forklift truck axle load is 10 to 15 kips. Table 5-1 is entered using 15 kips. Loaded at a frequency of 100 operation per day, the design index is 7. Figure 5-1 is entered using concrete flexure strength = 700 pounds per square inch, k = 100 pounds per cubic inch and DI = 7, slab thickness, h = 6.6 inches, or if rounded, 7 inches.